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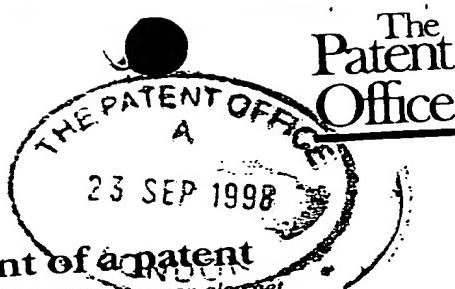


Dated 21 October 1999

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Patent Act 1977

**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference

PDG/IK/20917 GB

2. Patent application number

(The Patent Office will fill in this part)

23 SEP 1998

**9820757.4**3. Full name, address and postcode of the or of each applicant (underline all surnames)

British Broadcasting Corporation  
Broadcasting House  
London  
W1A 1AA

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

349555001

4. Title of the invention

Audio Compression

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

MATHYS & SQUIRE  
100 Grays Inn Road  
London WC1X 8AL

1081001

Patents ADP number (if you know it)

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body.

See note (d))

YES

24 SEP 1998 1392354-3 D02000  
P01/7700 25.00 - 9820757.4

REC'D	29 OCT 1999	The Patent Office
WIPO	PCT	Cardiff Road Newport Gwent NP9 1RH

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Continuation sheets of this form

Description

5  
2

Claim(s)

Abstract

Drawing(s)

1

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents  
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

*Marilyn Spear* Date  
23 September 1998

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr P D Garratt

0171 830 0000

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## AUDIO COMPRESSION

The present invention relates to audio compression, and particularly to decoding and recoding of compressed audio signals.

5

Earlier British Broadcasting Corporation International Application WO-A-98/33284, the entire disclosure of which is incorporated herein by reference, discloses a method of decoding and recoding digital audio which results in reduced impairment and quality, by communicating an auxiliary signal containing information concerning coding decisions.

10

A problem can arise, however, that the decoded audio is processed so that the additional information no longer becomes helpful in the recoding process. Our earlier application suggests either disabling the auxiliary data signal in the event of such processing or adding a tell-tale signal to the decoded audio to indicate that such processing has occurred.

15

Whilst the above system works well, it has been found that an alternative arrangement may offer improved results in certain circumstances.

20

According to a first aspect, the invention provides a method of audio signal processing comprising providing an auxiliary data signal for communicating with a decoded audio signal, the auxiliary data signal comprising information for use in re-encoding the decoded audio signal, the method further comprising providing signature information representative of the decoded audio signal for use in detecting a change in the decoded audio signal.

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In this way, rather than having to identify a tell-tale in the decoded audio, a change in the decoded audio can be automatically detected at the point of recoding by comparing the signature information to the decoded audio. Preferably, the signature

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information is communicated with the auxiliary data stream. Since the auxiliary data stream must, in any event, be read in order to effect re-encoding based on the auxiliary data stream, this may simplify processing.

5       The signature information may include a checksum derived from the values of the decoded audio samples. This may enable identification of even very minor changes, and allow maintenance of absolute purity of the audio signal.

10      Alternatively, the signature information may include statistical information derived from the decoded audio signal, for example mean signal level and, optionally, standard deviation of sample values from the mean. This may enable significant changes in the audio signal to be detected, whilst rendering the system insensitive to minor modifications.

15      The method may further comprise detecting whether the signature information matches the decoded audio, for example by comparing a signature derived from the decoded audio signals to the communicated signature information and detecting whether the difference between the derived and communicated signature exceeds a predetermined threshold. If the signature matches, then the decoded signals can be re-encoded using the auxiliary signal, for example in the manner described in our earlier application WO-A-98/33284. If the signature does not match, the decoded signal can be re-encoded without using the auxiliary data signal, or using only a part of the auxiliary data signal.

25      The auxiliary signal may be derived together with the signature information from a received compression-encoded audio signal as part of compression decoding of the compression encoded audio signal.

30      The auxiliary data signal may be selected from the signals described in our earlier application WO-A-98/33284.

Further aspects and preferred features are set out in the claims, to which reference should be made.

5 An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings in which Fig. 1 is a schematic diagram of cascaded decoding and re-encoding processes according to a preferred embodiment.

10 Referring to Fig. 1, a compressed audio signal is passed to a decoder 10 which extracts auxiliary information for use in re-coding the signal and decompresses the signal to produce a decoded audio signal and an auxiliary signal. In the embodiment shown, the decoded audio signal and auxiliary signal are output separately. The decoded audio signal passes through studio equipment which may process the signal and is re-encoded in an encoder 20. The auxiliary signal extracted is passed to the encoder 20 for use in re-encoding.

15 Thus far, the apparatus may be as described in our earlier WO-A-98/33284, the entire disclosure of which is incorporated herein by reference, with particular reference to Fig. 2 and the related description.

20 In the embodiment shown, the auxiliary signal is communicated separately from the decoded audio signal. As an alternative, for example as described in WO-A-98/33284, the auxiliary signal may be communicated with the decoded audio signal; one arrangement suitable for achieving this is described with reference to Fig. 3 of WO-A-98/33284.

25 In accordance with the present embodiment, in addition to auxiliary information for use in re-encoding, signature information representative of the decoded audio signal is calculated by the decoder 10 and communicated as part of the auxiliary data signal. The signature information may comprise, for example, a checksum calculated for individual audio samples or for a predetermined number of audio samples. The

provision of a checksum enables accurate verification of faithful reproduction of the audio signal. Alternatively, the signature information may comprise a measure derived from the decoded audio signal, for example a statistical measure such as the mean signal level, and optionally the standard deviation of samples from the mean.

5

The auxiliary signal and the signature signal are preferably conveyed together as a single digital data signal. They can advantageously be conveyed in the user bits of an AES-3 bitstream.

10

In the encoder 20, the signature information received is compared to a further signature calculated from the decoded audio signal which has been processed by the studio equipment. If the signatures match within a predetermined threshold, re-encoding is performed using the auxiliary information, for example in the manner described in WO-A-98/33284.

15

If the signatures do not match, re-encoding is performed without reference to the auxiliary signal.

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The setting of the threshold within which a match is detected will depend on the nature of the auxiliary signal and also the nature of the signature information. The threshold should be set so that the auxiliary information is used whenever it might assist the re-coding process but discarded when it will not improve the fidelity of the overall cascaded decoding and re-encoding processes.

25

In certain cases, rather than a "yes/no" comparison, the re-encoding process may be arranged to take some, but not all, of the auxiliary information into account or to modify a "blind" re-encoding process based on the auxiliary information when an imperfect signature match is detected, but not to discard the auxiliary information entirely.

30

It will be appreciated that there are numerous ways in which the invention can be

applied to assist in re-encoding of a previously decoded signal. In particular, it is to be noted that the present invention is not specifically limited to a basic decoding and recoding process as described in WO-A-98/33284, the disclosure of which is provided purely by way of an exemplary system in which the invention may be employed.

Each feature disclosed herein may be provided independently, unless otherwise stated.

CLAIMS

1. A method of audio signal processing comprising providing an auxiliary data signal for communicating with a decoded audio signal, the auxiliary data signal comprising information for use in re-encoding the decoded audio signal, the method further comprising providing signature information representative of the decoded audio signal for detecting a change in the decoded audio signal.  
5
2. A method according to Claim 1, wherein the signature information is included in the auxiliary data signal.  
10
3. A method according to Claim 1 or 2, wherein the signature information includes a checksum calculated from decoded audio samples.  
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4. A method according to any preceding claim, wherein the signature information includes a measure of the mean decoded audio signal level.  
20
5. A method of re-encoding a decoded audio signal comprising receiving the decoded audio signal, an auxiliary signal containing information for use in re-encoding the decoded audio signal and a signature information signal; checking whether the received signature information matches the decoded audio signal; and  
re-encoding the decoded audio signal based on re-encoding information contained in the auxiliary data signal if the signature information matches.  
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6. A method as claimed in Claim 5, wherein the signature information is combined with the auxiliary data signal.
- 30 7. Apparatus for decoding a compression encoded audio signal comprising

means for decoding the signal; means for extracting an auxiliary data signal containing information for use in re-encoding the signal; and means for deriving signature information representative of the decoded signal for use in detecting a change in the decoded signal.

5

8. Apparatus for re-encoding a decoded audio signal comprising:  
means for receiving said decoded audio signal together with auxiliary information for use in re-encoding the signal and signature information;  
means for checking whether the decoded audio information matches the signature information; and means for re-encoding the decoded signal based on the auxiliary information if the signature matches.
  
9. In combination, a decoded previously compression encoded audio signal, an auxiliary data signal comprising information for use in re-encoding the decoded audio signal, and a signature information signal representative of the decoded audio signal for use in detecting changes in the decoded audio signal.

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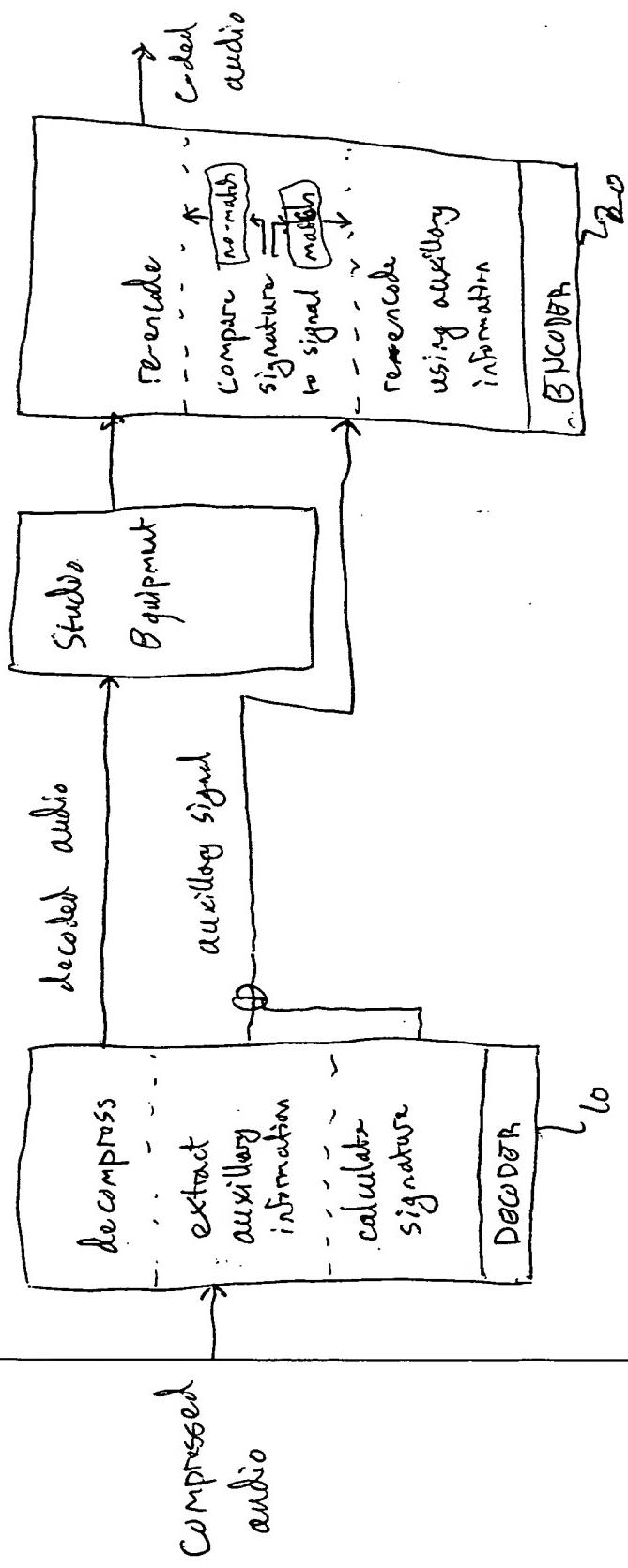


Fig. 1

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